

CLAIMS

What is claimed is:

1. A method for forming a liquid crystal alignment layer comprising:

5 a. disposing liquid crystals in a solvent;

 b. depositing the liquid crystals and solvent on a substrate;

 c. removing the solvent to form a liquid crystal film; and

 d. irradiating the liquid crystal film with light wherein the wavelength of the light overlaps the absorption spectrum of the liquid crystal.

10 2. The method of claim 1, wherein the depositing is one of spin coating and dip coating.

 3. The method of claim 1, wherein the light is one of linearly polarized, elliptically polarized, or partially polarized.

 4. The method of claim 1, wherein the liquid crystal film has a thickness ranging from about 2nm to about 0.1 μ m.

15 5. The method of claim 1, wherein the liquid crystal film has a thickness ranging from about 2nm to about 20 μ m.

 6. The method of claim 1 further comprising laying a patterned mask over the liquid crystal film prior to the irradiating step and removing the mask after the irradiating step.

20 7. The method of claim 1, wherein the liquid crystal is selected from the group consisting of 4-cyano-4'-alkylbiphenyls, 4-cyano-4'-alkyloxybiphenyls, 4-alkyl-4' alkoxy-azoxybenzenes and mixtures thereof.

 8. The method of claim 1, wherein the liquid crystal film has an easy axis of orientation and an anchoring energy, wherein at least one of the easy axis of orientation and anchoring energy is locally varied across the liquid crystal film by at least one of exposure time of the light at a point on the liquid crystal film and polarization of the light at a point on the liquid crystal film.

9. The method of claim 8, wherein the direction of the easy axis can be locally varied across the alignment layer from 0° to 360°.

10. The method of claim 8, wherein the anchoring energy ranges from about 10^4 to about 10^2 erg/cm².

5 11. A method of forming a liquid crystal cell comprising:

- a. providing two opposed substrates each covered with an electrode;
- b. disposing first liquid crystals in a solvent;
- c. depositing the first liquid crystals and solvent on at least one of the electrode covered substrates on the surface facing the other substrate;
- d. removing the solvent to form a liquid crystal film;
- e. irradiating the liquid crystal film with light wherein the wavelength of the light overlaps the absorption spectrum of the liquid crystal;
- f. placing spacers between the substrates;
- g. sealing three of the sides of the substrate to form a cell;
- h. filling the cell with a second liquid crystal; and
- i. sealing the cell.

12. The method of claim 11, wherein the depositing is one of spin coating and dip coating.

13. The method of claim 11, wherein the light is one of linearly polarized, 20 elliptically polarized, or partially polarized.

14. The method of claim 11, wherein the liquid crystal film has a thickness ranging from about 2nm to about 0.1 μm.

15. The method of claim 11, wherein the liquid crystal film has a thickness ranging from about 2nm to about 20nm.

25 16. The method of claim 11 further comprising laying a patterned mask over the liquid crystal film prior to the irradiating step and removing the mask after the irradiating step.

17. The method of claim 11, wherein the second liquid crystal is the same as the first liquid crystal in the liquid crystal film.

18. The method of claim 11, wherein the first liquid crystal has an easy axis of orientation and an anchoring energy, wherein at least one of the easy axis of orientation and anchoring energy is locally varied across the liquid crystal film by at least one of exposure time of the light at a point on the liquid crystal film and polarization of the light at a point on the liquid crystal film.

5 19. The method of claim 11, wherein the first liquid crystal is selected from the group consisting of 4-cyano-4'-alkylbiphenyls, 4-cyano-4'-alkyloxybiphenyls, 4-alkyl-4'alkoxy-azoxybenzenes, and mixtures thereof.

10 20. The method of claim 18, wherein the direction of the easy axis can be locally varied across the alignment layer from 0° to 360°.

21. The method of claim 18, wherein the anchoring energy ranges from about 10⁻⁴ to about 10⁻² erg/cm².

15 22. The method of claim 11, wherein an alignment layer is disposed on one of the substrates.

23. The method of claim 22, wherein the alignment layer is selected from the group consisting of rubbed polyimides, light-irradiated polyimides, rubbed polyvinyl-alcohol, light-irradiated polyvinyl-cinnamate, light-irradiated 20 polysiloxane-cinnamates, and oblique evaporated Al₂O₃.

24. A liquid crystal display comprising a first and second cell wall structure, electrodes disposed on facing sides of said first and second cell wall structures, an alignment layer disposed on at least one of said electrodes, and first liquid crystals disposed within a space between the first and second cell wall structures, wherein the alignment layer comprises a liquid crystal film comprising second liquid crystals, wherein the liquid crystal film has been irradiated with light that overlaps the absorption spectrum of the second liquid crystals.

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